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Paper: I (Mechanics)

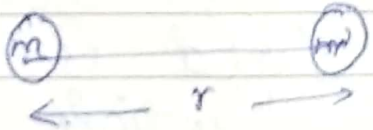
Gravitation

Newton's Law of Gravitation

According to this law,

"Every particle of matter in the universe attracts every other particle with a force which is directly proportional to the product of their masses and inversely proportional to the square of the distance between them"

$$F = G\frac{mm'}{r^2}$$



m, m' = Masses of Two particle.

r = distance between them.

G = Universal Gravitational constant

Values of $G = 6.67 \times 10^{-8}$ dynes-cm^2/gm^2 in C.G.S units.

A JOURNEY OF A THOUSAND MILES MUST BEGIN WITH A SINGLE STEP.

2019

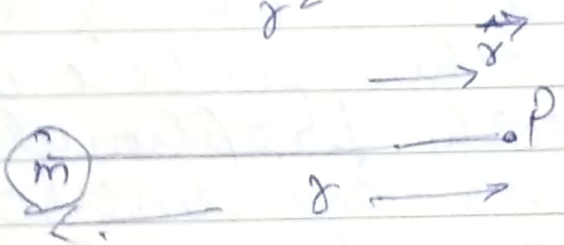
Gravitational field / Intensity of the field

"A region or space around a body within which its force of gravitational attraction is perceptible is called as Gravitational field".

Mathematically,

The intensity 'E' of the gravitational field of a particle of mass 'm' at a point

$$E = -\frac{mG}{r^2}$$



'−' sign indicates that intensity of the field is directed towards the particle

Gravitational Potential

Gravitational Potential at a point distant 'r' from a body of mass 'm' is defined as the amount of work done in bringing a unit mass from infinity to that point.

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T	W	T	F	S	S
				1	2
4	5	6	7	8	9
11	12	13	14	15	16
18	19	20	21	22	23
25	26	27	28	29	30

$$V = -\int_{\infty}^{r} E\,dr$$

$$= -\int_{\infty}^{r} \frac{m}{r^2} G = -\frac{mG}{r}$$

$$\boxed{V = -\frac{mG}{r}}$$

Gravitational Potential Energy

It is the amount of work done in bringing a mass from infinity to the point.

$$\boxed{U = m'V = -\frac{mm'G}{r}}$$